Besides the 4 screws on the housing cover, do not loosen any additional screws. Do not carry out repairs on the device. If defective, replace the device. Only enable the controller if the drive has been professionally installed and fully. Observe the handling specifications for electrostatically sensitive devices. Never remove or insert a plug connector when the motor controller is powered. Before mounting and installation work, switch off supply voltage and secure it against being switched on again. Only switch on the supply voltage again when mounting and installation work is complete.


This brief description is intended solely for initial information. The user documentation for the product also includes the following documents:

User documentation for the product

<table>
<thead>
<tr>
<th>Manual</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMCA-EC-S1-...</td>
<td>Device and functional description;</td>
</tr>
<tr>
<td></td>
<td>Mounting, installation, commissioning and diagnostics</td>
</tr>
<tr>
<td>EMCA-EC-S1-...</td>
<td>Description of the safety function “Safety switched-off torque” (Safe torque off/STO)</td>
</tr>
<tr>
<td>EMCA-EC-C-HP-...</td>
<td>Description of the device profile FHP (Festo Handling and Positioning Profile)</td>
</tr>
<tr>
<td>Help for the EMCA FCT</td>
<td>Online help of the Festo Configuration Tool (FCT) for commissioning and parameterisation</td>
</tr>
<tr>
<td>plug-in</td>
<td></td>
</tr>
<tr>
<td>Special documentation</td>
<td>Requirements for operating the product in the USA and Canada in accordance with certification by Underwriters Laboratories Inc. (UL)</td>
</tr>
</tbody>
</table>

1 Safety

- Always observe the safety information and warnings in the documentation of the product and of the other components used.
- Before mounting and installation work, switch off supply voltage and secure it against being switched on again. Only switch on the supply voltage again when mounting and installation work is complete.
- Never remove or insert a plug connector when the motor controller is powered.
- Observe the handling specifications for electrostatically sensitive devices.
- Only enable the controller if the drive has been professionally installed and fully parameterised.
- Do not carry out repairs on the device. If defective, replace the device.
- Besides the 4 screws on the housing cover, do not loosen any additional screws.

Warning

Danger of burns from hot housing surfaces. Contact with the motor housing can cause burn injuries. This can frighten people and cause them to act in an unpredictable manner. This can lead to other forms of secondary damage.
- Make sure that unintentional contact is not possible.
- Inform operating and maintenance staff about the possible hazards.
- Let the drive cool down to room temperature before maintenance work.

Caution

Rapidly rotating motor shaft with high torque. Contact with the motor shaft can cause burn injuries and abrasions.
- Ensure that the rotating motor shaft and components attached to it cannot be touched.

Note

Rapidly rotating motor shaft with high torque. Clothing, jewellery and hair can be caught and wrapped around the shaft. People can be injured as a result.
- Make sure that clothing, jewellery or hair cannot be caught by the rotating motor shaft.
- Ensure that clothing fits tightly.
- Personnel with long hair must wear hair nets.

1.1 Use for intended purpose

The product is intended for driving and controlling electromechanical drives. The product is intended for installation in a machine. Use exclusively:
- in perfect technical condition
- in original status without unauthorised modifications; only the expansions described in the documentation supplied with the product are permitted
- within the limits of the product defined through the technical data
- in an industrial environment

The product is intended for use in industrial environments. Outside of industrial environments, measures may need to be implemented for radio interference suppression, e.g. in commercial and mixed-residential areas.

1.2 Intended use of the STO function

The STO function (safe torque off) in accordance with EN 61800-5-2 is intended to shut down the torque of the integrated motor. The STO function prevents unexpected start-up of the integrated motor. The STO function may only be used in applications in which the specified safety characteristics suffice.

Safety characteristics

The product's STO function fulfills requirements for the following characteristic safety values:
- PL d/cat. 3 in accordance with ISO 13849-1 (Performance Level/PL)
- SIL 2 in accordance with EN 61800-5-2 (Safety Integrity Level/SIL)
- SIL Cl 2 in accordance with IEC 62061 (Claim Limit/CL)

The achievable safety level depends on the other components used to implement a safety function.

To protect against unintended motor start-up, the controller of the product must be activated via the connection [X6] with the category required for the application in accordance with ISO 13849-1, e.g. via an external safety relay.

Qualification of the specialist staff (requirements for staff)

The product may be placed in operation only by a qualified electro technician, who is familiar with the topics:
- installation and operation of electrical control systems
- applicable regulations for operating safety-engineering systems
- applicable regulations for accident prevention and occupational safety
- documentation for the product

Diagnostic coverage (DC) for the safety function

Diagnostic coverage is determined by inclusion of the product in the control chain and the measures implemented for the diagnostics. In order to achieve the specified diagnostic coverage, the status of the acknowledgment contact must be evaluated by the control system every time the STO function is requested. If a potentially dangerous malfunction is recognised during the diagnostics, appropriate measures must be taken to maintain the safety level.

Note

The device cannot detect a cross circuit in the input circuit by itself.
- If required, use a safety switching device with cross circuit detection.

1.3 Foreseeable misuse of the STO function

The following foreseeable misuses are among those not approved as intended use:
- Bridging of the STO function
- Applications where switching off can result in hazardous movements or conditions

Note

The STO function is not sufficient as the sole safety function for drives that are subject to permanent torque or force (e.g. suspended loads, vertical axes).
1.4 Obligations of the operator for the safety function

The implemented safety function must be subjected to a regular and documented performance test by a specialist during the period of use of the machine. The frequency of these tests must be determined by the machine operator based on the specifications of the machine manufacturer.

- Check the EMCA at least once per year.

2 Requirements for product use

- Provide the complete product documentation to the following personnel:
  - the design engineer and the installer of the machine or system
  - the personnel responsible for commissioning
- Store the documentation throughout the entire product lifecycle.
- Ensure compliance with the specifications in this documentation. Also observe the information in the documentation for the other components and modules (e.g. axial kit, gear unit, actuator, lines).
- Comply with all of the legal regulations that are applicable for the destination, as well as the following documents:
  - Regulations and standards
  - Regulations of the testing organisations and insurers
  - National specifications

For correct and safe use of the STO function:
- Conduct a risk assessment for your machine.
- Comply with the specified safety characteristics (Chapter 9, Technical data).

Range of application and certifications

The EMCA with integrated STO safety function is a safety-related part of control systems. The product has the CE marking. Certain configurations of the product have been certified by Underwriters Laboratories Inc. (UL).

For the EMCA:
- Certificates and declaration of conformity for the product (www.festo.com/sp).

Specified standards

|-----------------------------|---------------|------------------|------------------|

2.1 Transport and storage conditions

- Protect the product during transport and storage from excessive stress factors. Excessive stress factors include:
  - mechanical stresses
  - inadmissible temperatures
  - moisture
  - aggressive atmospheres
- Store and transport the product in its original packaging. The original packaging offers sufficient protection from typical stresses.

2.2 Technical prerequisites

For correct and safe use of the product:
- Comply with the specified connection and operating conditions for all of the connected components (Chapter 9). Only compliance with the limit values or load limits will enable operation of the product in compliance with the relevant safety regulations.

3 Product description

3.1 Product overview

- [X1]: Parameterisation interface (Ethernet interface)
- LED light guides (6x)
- [X3]: OUT
  - EtherCAT® – Port 1
  - EtherNet/IP – Port 1
  - PROFINET – Port 1
  - Cable throughfeeds (6x)
  - Motor flange
  - Through-hole for mounting (4x)
  - Mounting thread (4x) thread M4
  - Shaft
  - Cover
- [X2]: IN
  - EtherCAT® – Port 2
  - EtherNet/IP – Port 2
  - PROFINET – Port 2

4 Mounting

Note

- Excessive axial and radial forces on the motor shaft can damage the motor.
- Comply with maximum permissible shaft loads (Chapter 9).

The mounting flange offers the following options for fastening:
- Fastening via 4 through-holes for screws of size M6
- Fastening via 4 female threads of size M4 (screw-in depth [mm]: 5).

Observe the assembly instructions for the additional components used (e.g. axial kit, parallel kit, gear unit, shaft).

1. Move the slide or cantilever of the driven mechanical system into a safe position.
2. Connect the EMCA to the driven mechanical system (Assembly instructions of the additional components used).
3. Tighten the mounting screws (4x). Tightening torque (e.g. axial kit, parallel kit, gear unit, shaft).

5 Electrical installation

Caution

Unexpected and unintended movement of the drive during mounting, installation and maintenance work.
- Before starting work: Switch off power supplies. Removal of the enable signal at the EMCA is not sufficient.
- Secure the power supplies against accidental reactivation.

5.1 Connections and cables

Caution

Unexpected and unintended movement of the drive as a result of incorrectly assembled cables.
- Only use the counter-plugs from the NEKM-C assortment of plugs and preferably lines from the specified accessories (www.festo.com/catalogue).
- Lay all flexible cables so that they are free of kinks and mechanical stress, e.g. in a carrier chain. Observe the instructions for the axis and the additional components.
### 5.2 Parameterisation interface (Ethernet) [X1] – socket M12, 5-pin, D-coded
- Connect the EMCA to your network or directly to the PC via a hub/switch. Observe line specification (Device and functional description, EMCA-EC-SY-...).

**Recommendation:** Use the connecting cable NEBC-D12G4-... from Festo.

### 5.3 Bus/network [X2], [X3] – dependent on the product variant
(Profinet) – [X2]: IN (Port 2) – M12 socket, 5-pin, D-coded
- [X3]: OUT (Port 1) – M12 socket, 5-pin, D-coded

### 5.4 Power supply [X4]

**Warning**

Danger of electric shock from voltage sources without protective measures.
- For the electrical power supply, use only PELV circuits (protective extra-low voltage, PELV) in accordance with EN 60204-1.
- Also observe the general requirements for PELV circuits in accordance with EN 60204-1.
- Use only voltage sources which guarantee reliable electrical isolation of the operating and load voltage in accordance with EN 60204-1.

### 5.5 Braking resistor [X5]

**[X5] Pin**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ZK+</td>
</tr>
<tr>
<td>2</td>
<td>BR-CH</td>
</tr>
</tbody>
</table>

**Description**
- Connection for external braking resistor Rca 6-61; The braking resistor CACR-LE2-6-W60 from Festo is suitable.

### 5.6 STO interface [X6]

The STO safety function is described in detail in the document EMCA-EC-S1-.... The STO function should only be used in the manner described in this document.

**Recommendation for initial motor start-up without safety equipment:**
- The setup must at least include an emergency stop switching device
- 2-channel switch-off via the control ports STO1 [X6.4] and STO2 [X6.5]

<table>
<thead>
<tr>
<th>[X6] Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC1</td>
</tr>
<tr>
<td>2</td>
<td>NC2</td>
</tr>
<tr>
<td>3</td>
<td>+24 V DC</td>
</tr>
<tr>
<td>4</td>
<td>LOGIC OUT</td>
</tr>
<tr>
<td>5</td>
<td>STO 1</td>
</tr>
<tr>
<td>6</td>
<td>STO 2</td>
</tr>
<tr>
<td>7</td>
<td>GND</td>
</tr>
</tbody>
</table>

**Description**
- Acknowledgment contact: Potential-free
- Low impedance if the STO function has been requested and activated via 2 channels
- Logic voltage output (from [X4.1]), reference potential (0 V) is pin [X6.6] or [X4.2] (internally bridged)
- Not overload-proof! Max. 100 mA permissible.

### 5.7 End/reference switch [X7], [X8]

<table>
<thead>
<tr>
<th>[X7] Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24 V DC</td>
</tr>
<tr>
<td>2</td>
<td>Switch 1</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[X8] Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24 V DC</td>
</tr>
<tr>
<td>2</td>
<td>Switch 2</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
</tr>
</tbody>
</table>

### 5.8 I/O interface [X9]

<table>
<thead>
<tr>
<th>[X9] Pin</th>
<th>Type¹</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DOUT</td>
<td>Ready</td>
<td>Signals the ready status</td>
</tr>
<tr>
<td>2</td>
<td>DOUT</td>
<td>configurable</td>
<td>Output behavior configurable with FCT</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>24 V DC</td>
<td>Output 24 V DC, looped through from [X4.1]</td>
</tr>
<tr>
<td>4</td>
<td>DIN</td>
<td>Control enable</td>
<td>Enable/block controller</td>
</tr>
<tr>
<td>5</td>
<td>DIN</td>
<td>Sample</td>
<td>Signal for storing the actual position (ad hoc measurement)</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>Reference potential 0 V</td>
<td></td>
</tr>
</tbody>
</table>

¹) DIN = digital input; DOUT = digital output

### 5.9 External battery [X10] – only EMCA-EC-,...-1TM

**[X10] Pin**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Battery +</td>
</tr>
<tr>
<td>2</td>
<td>Battery - (GND)</td>
</tr>
</tbody>
</table>

**Description**
- Connection for external battery (Position changes are recorded for up to 7 days without supply voltage and without battery (after charging for approx. 24 hours)). With the EADA-A-9 battery from Festo, the duration is extended up to 6 months.

### 5.10 Ensuring the IP degree of protection

- Comply with requirements for securing the IP degree of protection (Device and functional description, EMCA-EC-SY-...).
# LED status and event/status

<table>
<thead>
<tr>
<th>LED</th>
<th>LED status</th>
<th>Event/status</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK</td>
<td>Flashing green</td>
<td>Start-up phase, bootloader active</td>
</tr>
<tr>
<td>ERROR</td>
<td>Flashing red</td>
<td>Hardware is not ready for operation; an error is present.</td>
</tr>
</tbody>
</table>

## Diagnostics and fault clearance

### 7. Diagnostics and fault clearance

Information on the bus-specific LEDs (MS, NS, ACT/LINK) → Description of the device profile.

### 8. Cleaning, repair and disposal

- Clean the outside of the product with a soft cloth.
- Repair or maintenance of the product is not permissible. If necessary, replace the complete product.

### 9. Technical data

For detailed technical data on the STO interface → Description of the safety function STO EMCA-EC-S1-... For additional technical data → Device and functional description EMCA-EC-SY-...

Requirements for complying with the certified UL conditions if the product is operated in the USA or Canada can be found in the separate UL special documentation.